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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/570,765	09/29/2006	Veit Stegmann	13156-00041-US1	7022
23416 7590 05/27/2009 CONNOLLY BOVE LODGE & HUTZ, LLP P O BOX 2207 WILMINGTON, DE 19899				
EXAMINER				
CUTLIFF, YATE KAI RENE				
ART UNIT		PAPER NUMBER		
1621				
MAIL DATE		DELIVERY MODE		
05/27/2009		PAPER		

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/570,765

Applicant(s)

STEGMANN ET AL.

Examiner

YATE' K. CUTLIFF

Art Unit

1621

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 March 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 & 3 - 19 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-19 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/CDC)
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____
- Paper No(s)/Mail Date: _____

DETAILED ACTION

Status of Claims

1. Claims 1 and 3- 19 are pending.
Claim 2 has been canceled
Claims 1 and 3- 19 are rejected.
2. The indication of allowability of the subject matter for claims 2, 17 and 18 is withdrawn. After final consideration withdrawal of the subject matter previously indicated allowable are not now allowable in view of the newly cited reference set out below.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
4. Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
5. Claim 1 recites the limitation "the mixture" in lines 7 and 8. There is insufficient antecedent basis for this limitation in the claim. Applicant can amend the claims and change the limitation to "a mixture" for both renditions of the term.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining

obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 1, 3 – 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shin Etsu Chem CO Ltd. (JP 56-150026) (Shin)[see 1449], in view of TCI Europe N.V.(Abstract 1999), in view of Metz et al. (US 5,767,330), in view of Sigma-Aldrich (cataloge pages 1-3, 14 & 21), and in view of Green et al. (US 2,308,170).

10. The rejected claims cover, inter alia, a process comprising reacting alcohol with hydrogen halide, wherein the reaction of the alcohol with the hydrogen halide occurs in

the presence of an ionic liquid at a temperature which is above 100°C for at least part of the time and, at least at the time of commencement of the reaction, the water content is not more than 25 mol% based on the amount of ionic liquid, where the ionic liquid is not octyltrimethylammonium chloride; and, wherein part or all of the hydrogen halide is passed into the mixture comprising the alcohol and the ionic liquid at temperatures below 100°C and the mixture formed by the addition is heated to temperatures above 100°C for part of the time. According to the dependent claims, the reaction temperature can be 110°C to 150°C; the hydrogen halide can be HCl or HBR, the ionic liquid may consist of cation of pyridine and an anion that is a halide; the ionic liquid can be a N-methylpyridinium and a halide; and the ionic liquid has a melting point of less than 150°C, the molar ration of ionic liquid to OH group is 1 to 3 mol. Also, the commencement of the reaction it is carried out in the absence of water or substantial absence of water, and the water produced by the reaction is continuously removed. Continuous removal of the water causes the water content to be maintained as a level not more than 25% or not more than 5% based on the amount of ionic liquid. Furthermore, the rejected claims set out various alcohols selected from a group of alcohols having one or more than one OH group for use in the reaction process of claim 1. Furthermore, the rejected claims state that the haloalkane is isolated from the reaction mixture by distillation. The water that is continuously removed from the reaction can be removed by distillation. Also, the process as disclosed is capable of being carried out where the reaction alcohol is any alcohol having more than one OH group. Lastly, the process includes the use of ionic liquids with melting points less than 100°C.

11. Shin discloses a process for making methyl chloride by reacting gaseous methyl alcohol and hydrogen chloride gas in the presence of N-methylpyridinium chloride (ionic liquid (a) where $R7 = CH_3$, $R1-R6 = H$, & anion is Cl^-), which is a quaternary salt of pyridine. The reaction temperature is $150^\circ C$. The by-product water is condensed and separated. Further, Shin is silent with regard to the addition of water at the commencement of the reaction, however, the other reactants are passed into the reaction vessel in the gaseous form at the commencement of the reaction, therefore, it is implied that the reaction is carried out in the absence of water. Carrying out the reaction in the absence of water means that the water content of Shin, at least at the commencement of the reaction is less than 25%. The only water mentioned in Shin is the water that is formed as a result of the reaction. The water of reaction is continuously removed after being condensed in the continuous reaction process of Shin. Further, from the information provided in the table the ratio of ionic liquid to OH group appears to be about 2 to 1. (see English translation of Example and table provided with 1449). Shin discloses that at the onset of the process, after the reaction vessel is charged with the N-ethylpyridinium chloride, nitrogen gas is supplied to the system.

Additionally, Shin's process uses a bubble plate column, in a continuous process, to produce methyl chloride at high yield and purity. The process may use hydrogen chloride in the presence of a quaternary ammonium halide salt, which is preferably a quaternary salt of pyridine. In Shin the by-product gases from the top of the reaction vessel were condensed and separated. The by-products of the condensing process

were water, unreacted methyl alcohol and hydrogen chloride. The methyl chloride formed was collected in a liquid form in a trap.

12. The difference between Shin and Applicant's claimed process is the following; passing the hydrogen halide in to the mixture at a temperature below 100°C then heating mixture to above 100°C; the use of 2-ethylpyridinium chloride; isolation of the haloalkane by distillation, removal of water by distillation; the reaction using alcohols with more than one OH group; that the quaternary salt of pyridine has a melting point less than 100°C; and keeping the water content of the reaction not more than 25% or not more than 5% based on the amount of ionic liquid over the entire reaction.

13. However, with regard to passing the hydrogen halide in to the mixture at a temperature below 100°C then heating mixture to above 100°C; the claimed process reads on adding the alcohol, hydrogen halide and ionic liquid at room temperature and then heating. Shin's process heats the ionic salt to 150°C forming the ionic liquid and then supplies the hydrogen chloride gas and gaseous methyl alcohol to the reaction process and then maintains the reaction temperature. (see Example 1). It is known in the art that hydrogen chloride is a gas at room temperature (generally below 100°C) and that methyl alcohol can be in its gaseous state at a temperature below 100°C. As such, based on the discussion in the Example of Shin, both the hydrogen chloride gas and the gaseous methyl alcohol were likely at a temperature below 100°C at the time they both entered the glass bubble plate from the base of the column. Further, since there is nothing in the Example to indicate that the gases entered the reaction vessel with the ionic liquid sequentially, nor that the temperature of the gases were raised before

entering the reaction vessel and initial mixing occurred; one skilled in the art reading Shin would understand that the entry of the gases to the reaction vessel and the initial mixing occurred at temperatures below 100°C. The purpose of Shin's process was to solve the same problem as Applicant's process obtains methyl chloride at a high yield and purity, at a lower temperature and at a higher reaction rate. (see abstract). It appears that Shin was able to solve the same problem as Applicant sought to solve with a similar processing sequence. Thus, variations of the contact temperatures for alcohol, hydrogen halide and ionic liquid this type of reaction process appears to be within the level of skill of one having ordinary skill in the art. This limitation is deemed to be obvious absent a showing of unexpected results.

A reference is good not only for what it teaches by direct anticipation but also for what one of ordinary skill in the art might reasonably infer from the teachings. (*In re Opprecht* 12 USPQ 2d 1235, 1236 (Fed Cir. 1989); *In re Bode* 193 USPQ 12 (CCPA) 1976). In light of the forgoing discussion, the Examiner concludes that the subject matter defined by the instant claims would have been obvious within the meaning of 35USC 103(a). From the teachings of the references, it is apparent that one of ordinary skill in the art would have had a reasonable expectation of success in producing the claimed invention. Therefore, the invention as a whole was *prima facie* obvious to one of ordinary skill in the art at the time the invention was made, as evidenced by the references, especially in the absence of evidence to the contrary.

14. Further, with regard to the use of 2-ethylpyridinium chloride its use is within the purview of the skilled artisan because 2-ethylpyridinium chloride is a quaternary salt of

pyridine and Shin broadly implies that any quaternary salt of pyridine is useful in the reaction to produce its methyl chloride. Also, in Shin the temperature of the reaction vessel with the N-methylpyridinium chloride is raised to 150°C which would melt the ionic salt forming an ionic liquid. This presumption is based on Applicant's admission that ionic liquids are also referred to ionic salts that are salt melts. Furthermore, from TCI it is known that N-methylpyridinium chloride has a melting point of 144°C. As such, when the temperature of Shin is raised to above 150°C the N-methylpyridinium chloride becomes an ionic liquid. Therefore, it would have been obvious to one skilled in the art at the time the claimed invention was made to substitute 2-ethylpyridinium chloride for the N-methylpyridinium chloride in the claimed process.

One skilled in the art would have been motivated to make the change to include the 2-ethylpyridinium chloride in the reaction process because Shin states that quaternary salts of pyridine are useful in a reaction to make methyl chloride where the reactants are methyl alcohol and hydrogen chloride.

15. With regard to the isolation of the haloalkane by distillation and the removal of water by distillation, the process of Shin is a continuous reaction process with ongoing separation of the gases and liquid formed by the reaction. It is within the purview of the skilled artisan to expect that in a reaction system such as Shin where a mixture is continuously fed into an industrial type of reaction process, which includes a condenser, that some distillation can be deemed to occur. Therefore, it is within the purview of a person of ordinary skill in the art of industrial chemical processing to expect that a distillation step would

have been included in the process of Shin. These limitations are deemed to be obvious absent a showing of unexpected results.

A reference is good not only for what it teaches by direct anticipation but also for what one of ordinary skill in the art might reasonably infer from the teachings. (*In re Opprecht* 12 USPQ 2d 1235, 1236 (Fed Cir. 1989); *In re Bode* 193 USPQ 12 (CCPA) 1976). In light of the forgoing discussion, the Examiner concludes that the subject matter defined by the instant claims would have been obvious within the meaning of 35USC 103(a). From the teachings of the references, it is apparent that one of ordinary skill in the art would have had a reasonable expectation of success in producing the claimed invention. Therefore, the invention as a whole was *prima facie* obvious to one of ordinary skill in the art

16. With regard to the use of an alcohol in the process that has more than one OH group, such as 1,2-ethanediol or 1,2-propanediol, would be within the purview of the skilled artisan based on the teaching of Metz et al. Metz et al. was faced with the problem of finding a simplified process for making haloalkanes from alcohols while obtaining high space/time yields. (see column 1, lines 56-58). The Metz et al. reaction solved the problem by using amine hydrohalide pyridine salt, dehydrated by preheating, with alcohols having one OH group and more than one OH group. (see Example 1 and Example 2). The Metz et al. reaction was successful for the production of alkyl chlorides using alcohol with a single OH group and was successful for the production of di-alkyl chlorides from diols.

It would have been obvious to one of ordinary skill in the art at the time the claimed invention was made modify the process of Shin and substitute the monoalcohol with a diol in the reaction process for making haloalkanes. One of ordinary skill in the art would have been motivated to use other alcohols with more than one OH group because when amine hydrohalide pyridine salts were used in a similar process for making di-alkyl chlorides, such as in Metz et al., each of the OH groups were replaced by the halogen. The motivation for making the diol substitution is suggested by Metz et al. where they successfully prepared the haloalkanes, with a high space/time yield, in a similar process using diols.

Therefore, the invention as a whole was *prima facie* obvious to one of ordinary skill in the art at the time the invention was made, as evidenced by the references, especially in the absence of evidence to the contrary.

17. However, with regard to the quaternary salt of pyridine having a melting point of less than 100°C, Sigma-Aldrich discloses ionic liquids with a pyridine base that have a melting point of less than 100°C i.e. 1-butyl-4-methylpyridinium tetrafluoroborate and 1-butyl-4-methylpyridinium hexafluorophosphate. (see catalog pages 14 and 21). Since Shin broadly implies that any quaternary salt of pyridine is useful in the reaction to produce the methyl chloride, and ionic liquids having a pyridine base with a melting point of less than 100°C are disclosed by Sigma-Aldrich, it is within the purview of the skilled artisan to use ionic liquids with this property in the process for making haloalkanes. Therefore, it would have been obvious to one skilled in the art at the time

the claimed invention was made to use an ionic liquid having a melting point of less than 100°C in the claimed process.

One skilled in the art would have been motivated to make the change to include an ionic liquid with a melting point of less than 100°C in the reaction process because Shin states that quaternary salts of pyridine are useful in a reaction to make methyl chloride where the reactants are methyl alcohol and hydrogen chloride.

Therefore, the invention as a whole was *prima facie* obvious to one of ordinary skill in the art at the time the invention was made, as evidenced by the references, especially in the absence of evidence to the contrary.

18. Furthermore, with regards to keeping the water content of the reaction not more than 25% or not more than 5% based on the amount of ionic liquid over the entire reaction; Green in its production of alkyl halides states that water accumulation in the process of producing alkyl halides causes the concentration of the hydrochloric acid to diminish and a decrease in the reaction rate. Green states that for these reasons the continuous removal of water is required. (see page 2, column 2 lines 55-58 & page 1, column 1, lines 20-26. Thus, one of ordinary skill in the art, in view of the teachings of Green, would want to maintain low levels of water throughout the reaction process, because it is known that if too much of the water produced during the reaction process is allowed to remain in the reaction, it would slow the reaction and ultimately reduce the yield. Thus, these limitations are deemed to be obvious absent a showing of unexpected results.

A reference is good not only for what it teaches by direct anticipation but also for what one of ordinary skill in the art might reasonably infer from the teachings. (*In re Opprecht* 12 USPQ 2d 1235, 1236 (Fed Cir. 1989); *In re Bode* 193 USPQ 12 (CCPA) 1976). In light of the forgoing discussion, the Examiner concludes that the subject matter defined by the instant claims would have been obvious within the meaning of 35USC 103(a). From the teachings of the references, it is apparent that one of ordinary skill in the art would have had a reasonable expectation of success in producing the claimed invention. Therefore, the invention as a whole was *prima facie* obvious to one of ordinary skill in the art at the time the invention was made, as evidenced by the references, especially in the absence of evidence to the contrary.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YATE' K. CUTLIFF whose telephone number is (571)272-9067. The examiner can normally be reached on M-TH 8:30 a.m. - 5:00 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Daniel M. Sullivan can be reached on (571) 272 - 0779. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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